computers & operations research

List of Contents and Author Index Volume 14, 1987



PERGAMON PRESS

oxfordenew yorkebeijingefrankfurtesão paulo sydneyetokyoetoronto

computers & operations research

and Their Application to Problems of World Concern

editor

Samuel J. Raff 8312 Snug Hill Lane Potomac, MD 20854

editorial advisory board

Vijay Aggarwal Lucknow, India

Donald Aucamp Edwardsville, Illinois

Oded Berman Calgary, Canada

L. Bianco Rome, Italy

Lawrence Bodin College Park, Maryland

Israel Borovitz Tel Aviv. Israel

J.I. Bowen Silver Spring, Maryland

Ellison Burton Washington, D.C.

Wilfred Candler Washington, D.C.

J.A. Chisman Clemson, South Carolina

Louis Clarenburg The Netherlands **Brian Conolly**

London, England Eliezer Arantes da Costa Vitoria Espirito Santo, Brazil

Richard Deckro Laramie, Wyoming Charles DeWald East Amherst, New York

John Dinkel College Station, Texas

H.A. Eiselt Montreal, Canada

E.A. Elsayed Piscataway, New Jersey

Joseph Engel Washington, D.C. James Fisk

Albany, New York J.O. Frendewey Blacksburg, Virginia

Moshe Friedman Coral Gables, Florida

Saul Gass College Park, Maryland PL viz Ghandforoush

Falls Church, Virginia **Bruce Golden** College Park, Maryland

Donald Gross Washington, D.C.

Jatinder Gupta Muncie, Indiana Edward L. Hannan Albany, New York

Michael Harnett Ruston, Louisiana John Honig

Bethesda, Maryland James Ignizio

Houston, Texas Jacob Intrator Ramat Gan. Israel

James P. Jarvis Clemson, South Carolina

N.K. Kwak St Louis, Missouri Robert Jennette Annapolis, Maryland

Mark H. Karwan Buffalo, New York

lan Knight Gaithersburg, Maryland

Santi B. Lahiri Winchester, Massachusetts Judah Lando

Kear Haroeh, Israel Gilbert Laporte

Montreal, Canada Richard Larson

Cambridge, Massachusetts

Cecil E. Law Kingston, Ontario, Canada

Kenneth D. Lawrence Bedminster, New Jersey

Reuven Levary St Louis, Missouri Jay Liebowitz

Rockville, Maryland William Marlow Washington, D.C.

Bruno O. Martinoli Genoa, Italy

Laurence Moore Blacksburg, Virginia

Ury Passy Haifa, Israel

Aubrey Pryce Norfolk, England

Mark Schneiderjans Lincoln, Nebraska

Shigemichi Suzuki Tokyo, Japan Bernard W. Taylor

Blacksburg, Virginia E.P. Winkofsky Dayton, Ohio

M. Zafer Yakin Holmdel, New Jersey

Milan Zeleny New York

Publishing Office: Journals Production Unit, Pergamon Journals Ltd, Hennock Road, Marsh Barton, Exeter EX2 8NE, England (*Telephone*: Exeter (0392) 51558; *Telex*: 42749).

Subscription and Advertising Offices: North America: mon Journals Inc., Maxwell House, Fairview Park, Elmsford, NY 10523, U.S.A.: Rest of the World: Pergamon Journals Ltd, Headington Hill Hall, Oxford OX3 0BW, England (Tel. Oxford (0865) 64881).

annual subscription rates 1987

published 6 issues/annum

Annual institutional subscription rate (1987) DM 685.00; 2-year

institutional rate (1987/88) DM 1301.50; personal subscription rate for those whose library subscribes at the regular rate (1987) DM 27.00. Prices are subject to change without notice.

microform subscriptions and back issues

Back issues of all previously published volumes are available in the regular edition and on microfilm and microfiche. Current subscriptions are available on microfiche simultaneously with the paper edition and on microfilm on completion of the annual index at the end of the subscription year.

copyright © 1987 Pergamon Journals Limited

It is a condition of publication that manuscripts submitted to this journal have not been published and will not be simultaneously submitted or published elsewhere. It is a consistent or be simultaneously associated for the surface and will not be simultaneously associated or published or building a manuscript, the authors agree that the copyright for their article is transferred to the publisher if and when the article is accepted for publication. However, assignment of copyright is not required from authors who work for organizations which do not permit such assignment. The copyright covers the exclusive rights to reproduce and distribute the article, including reprints, photographic reproductions, microform or any other reproductions of similar nature, and translations. No part of this publication may be reproduced, stored in a retrieval system or transmitted in any form or by any means, electrosite, electrostatic, magnetic tape. mechanical, photocopying, recording or otherwise, without permission in writing from the copyright hold

PHOTOCOPYING INFORMATION FOR USERS IN THE U.S.A.

The Item-fee Code for this publication indicates that authorization to photocopy items for internal or personal use is granted by the copyright holder for libraries and other users registered with the Copyright Clearance Center (CCC) Transactional Reporting Service provided the stated fee for copying beyond that permitted by Section 107 or 108 of Street, Selem, MA 01970.

Permission for other use. The copyright clearance Center Inc., 27 Congress Street, Selem, MA 01970.

Permission for other use. The copyright owner's consent does not extend to copying for general distribution, for promotion, for creating new works, or for resale. Specific written permission must be obtained from the publisher for copying.

The Item-fee Code for this publication is 0305-0548/87 \$3.00+0.00

Pergamon Journals Ltd Headington Hill Hall, Oxford OX3 OBW, England Pergamon Journals Inc. Maxwell House, Fairview Park, Elmsford, NY 10523, U.S.A.

List of Contents

NUMBER 1

- Softstrip® data strip containing the table of contents of this issue
- Yigal Gerchak and Mahmut Parlar
- Sohail S. Chaudhry,
 I. Douglas Moon and
 S. Thomas McCormick
- F. H. Murphy, S. Sen and A. L. Soyster
- A. Borthakur, J. Medhi and R. Gohain
- Jatinder N. D. Gupta,
 J. George Shanthikumar
 and Wlodzimierz Szwarc
- Eng Choo and Chaiho Kim
- Howard J. Weiss and J. Yael Assous
- Mark H. Karwan and Balasubramanian Ram
- Announcement
- Software Survey Section

- A single period inventory problem with partially controllable demand
- 11 Conditional covering: greedy heuristics and computational results
- 19 Electric utility expansion planning in the presence of existing capacity: a nondifferentiable, convex programming approach
- 33 Poisson input queueing system with startup time and under control-operating policy
- 41 Generating improved dominance conditions for the flowshop problem
- 47 One-dimensional simplex search
- 55 Reduction in problem size for ranking alternatives in group decision-making
- 67 A Lagrangean dual-based solution method for a special linear programming problem
- 75 Single server stochastic recirculation systems

i Softstrip® data strip containing the table of contents of this issue

87 A goal programming model to optimize departmental

- Marc J. Schniederjans and Gyu Chan Kim
- Michael Gibson, John J. Bernardo, Chen Chung and Ralph Badinelli
- Hussein M. Abdel-Wahab and Tiko Kameda
- 97 A comparison of interactive multiple-objective decision making procedures
- 107 File space utilization in database conversion

preference in course assignments

Jati K. Sengupta 117 Data envelopment analysis for efficiency surement in the stochastic case F. D. Singleton Jr and Russell G. Thompson 131 Integration of nonconvexities/nonlinearities in w water treatment engineering design into producost functions for ethylene Arie Segev 145 Algorithms for distributed data processing C. S. Sung and J. T. Rhee 163 A dynamic production scheduling model with sales or backlogging Gülseren Ünlü 173 A linear bilevel programming algorithm base bicriteria programming Lawrence Bodin 181 Technical Note regarding the paper by Aggarwa Suresh Vijay Aggarwal 181 Comments on the Technical Note by Bodin Software Survey Section 1 NUMBER 3 i Softstrip® data strip containing the table of colof this issue Cheryl Gaimon, Shantha Mohan and Gerald L. Thompson Hasan Pirkul 197 Efficient algorithms for the capacitated concellocation problem Stephen P. Shao Jr 209 A solution comparison for dual angular programs Barry L. Nelson 219 On control variate estimators Saul I. Gass 227 The setting of weights in linear goal-program	
Russell G. Thompson water treatment engineering design into producost functions for ethylene Arie Segev 145 Algorithms for distributed data processing C. S. Sung and J. T. Rhee 163 A dynamic production scheduling model with sales or backlogging Gülseren Ünlü 173 A linear bilevel programming algorithm base bicriteria programming Lawrence Bodin 181 Technical Note regarding the paper by Aggarwa Suresh Vijay Aggarwal 181 Comments on the Technical Note by Bodin Software Survey Section I NUMBER 3 i Softstrip® data strip containing the table of coof this issue Cheryl Gaimon, Shantha Mohan and Gerald L. Thompson Hasan Pirkul 197 Efficient algorithms for the capacitated concertlocation problem Stephen P. Shao Jr 209 A solution comparison for dual angular programs Barry L. Nelson 219 On control variate estimators Saul I. Gass 227 The setting of weights in linear goal-program	nea-
C. S. Sung and J. T. Rhee 163 A dynamic production scheduling model with sales or backlogging 173 A linear bilevel programming algorithm base bicriteria programming 181 Technical Note regarding the paper by Aggarwa Suresh Vijay Aggarwal 181 Comments on the Technical Note by Bodin Software Survey Section 183 A network approach to cohort personnel pla using cross-sectional data Gerald L. Thompson Hasan Pirkul 197 Efficient algorithms for the capacitated concertocation problem Stephen P. Shao Jr 209 A solution comparison for dual angular programs Barry L. Nelson 219 On control variate estimators Saul I. Gass 227 The setting of weights in linear goal-programs	
Gülseren Ünlü 173 A linear bilevel programming algorithm base bicriteria programming Lawrence Bodin 181 Technical Note regarding the paper by Aggarwa Suresh Vijay Aggarwal 181 Comments on the Technical Note by Bodin Software Survey Section I NUMBER 3 i Softstrip® data strip containing the table of colof this issue Cheryl Gaimon, Shantha Mohan and Gerald L. Thompson Hasan Pirkul 197 Efficient algorithms for the capacitated concellocation problem Stephen P. Shao Jr 209 A solution comparison for dual angular programs Barry L. Nelson 219 On control variate estimators Saul I. Gass 227 The setting of weights in linear goal-program	
Lawrence Bodin 181 Technical Note regarding the paper by Aggarwa Suresh Vijay Aggarwal 181 Comments on the Technical Note by Bodin Software Survey Section I NUMBER 3 i Softstrip® data strip containing the table of color of this issue Cheryl Gaimon, Shantha Mohan and Gerald L. Thompson Hasan Pirkul 197 Efficient algorithms for the capacitated concert location problem Stephen P. Shao Jr 209 A solution comparison for dual angular programs Barry L. Nelson 219 On control variate estimators Saul I. Gass 227 The setting of weights in linear goal-program	lost-
Suresh Vijay Aggarwal 181 Comments on the Technical Note by Bodin Software Survey Section I NUMBER 3 i Softstrip® data strip containing the table of color of this issue Cheryl Gaimon, Shantha Mohan and Gerald L. Thompson Hasan Pirkul 197 Efficient algorithms for the capacitated concert location problem Stephen P. Shao Jr 209 A solution comparison for dual angular programs Barry L. Nelson 219 On control variate estimators Saul I. Gass 227 The setting of weights in linear goal-program	d on
NUMBER 3 i Softstrip® data strip containing the table of color of this issue Cheryl Gaimon, Shantha Mohan and Gerald L. Thompson Hasan Pirkul 197 Efficient algorithms for the capacitated concertocation problem Stephen P. Shao Jr 209 A solution comparison for dual angular programs Barry L. Nelson 219 On control variate estimators Saul I. Gass 227 The setting of weights in linear goal-program	l and
I Softstrip® data strip containing the table of confidence of this issue Cheryl Gaimon, Shantha Mohan and Gerald L. Thompson Hasan Pirkul 197 Efficient algorithms for the capacitated concertocation problem Stephen P. Shao Jr 209 A solution comparison for dual angular programs Barry L. Nelson 219 On control variate estimators Saul I. Gass 227 The setting of weights in linear goal-programs	
i Softstrip® data strip containing the table of color of this issue Cheryl Gaimon, Shantha Mohan and Gerald L. Thompson Hasan Pirkul 197 Efficient algorithms for the capacitated concerlocation problem Stephen P. Shao Jr 209 A solution comparison for dual angular programs Barry L. Nelson 219 On control variate estimators Saul I. Gass 227 The setting of weights in linear goal-program	
Cheryl Gaimon, Shantha Mohan and Gerald L. Thompson Hasan Pirkul 197 Efficient algorithms for the capacitated concerlocation problem Stephen P. Shao Jr 209 A solution comparison for dual angular programs Barry L. Nelson 219 On control variate estimators Saul I. Gass 227 The setting of weights in linear goal-program	
Shantha Mohan and Gerald L. Thompson Hasan Pirkul 197 Efficient algorithms for the capacitated concellocation problem Stephen P. Shao Jr 209 A solution comparison for dual angular programs Barry L. Nelson 219 On control variate estimators Saul I. Gass 227 The setting of weights in linear goal-program	ntents
Stephen P. Shao Jr 209 A solution comparison for dual angular programs Barry L. Nelson 219 On control variate estimators Saul I. Gass 227 The setting of weights in linear goal-program	nning
programs Barry L. Nelson 219 On control variate estimators Saul I. Gass 227 The setting of weights in linear goal-program	itrator
Saul I. Gass 227 The setting of weights in linear goal-program	linear
problems	nming
H. Arsham 231 A stochastic model of optimal advertising policy	ulsing
Sanjiv Sarin and 241 A computational evaluation of two subgradient methods	search
Shaul P. Ladany and Abraham Mehrez 249 Maximization of the probability to score at given distance in a long-jump competition	east a
C. Y. Liu and R. L. Bulfin 257 Scheduling ordered open shops	
Software Survey Section	

NUMBER 4

Softstrip® data strip containing the table of contents of this issue Marek Hessel and Milan Zeleny 265 Optimal system design: towards new interpretation of shadow prices in linear programming Robert M. O'Keefe 273 An interactive simulation description interpreter Wen-Lea Pearn, Arjang Assad 285 Transforming arc routing into node routing problems and Bruce L. Golden I. Adiri and Z. Yehudai 289 Scheduling on machines with variable service rates K. L. Mak Determining optimal production-inventory control policies for an inventory system with partial backlogging Robert T. Sumichrast 305 Scheduling parallel processors to minimize setup time Ignacy Kaliszewski 315 A modified weighted Tchebycheff metric for multiple objective programming C. C. Nwannenna 325 A computer model for power system control **Software Survey Section**

NUMBER 5

		NOMBER 5
	i	Softstrip® data strip containing the table of contents of this issue
Tom M. Cavalier and Kenneth C. Schall	341	Implementing an affine scaling algorithm for linear programming
M. M. Srinivasan and K. Kant	349	The file allocation problem—A queueing network optimization approach
Timothy D. Fry and G. Keong Leong	363	A bi-criterion approach to minimizing inventory costs on a single machine when early shipments are forbidden
Samuel S. Chiu	369	The minisum location problem on an undirected network with continuous link demands
C. M. Shetty and Richard W. Taylor	385	Solving large-scale linear programs by aggregation
Fatemeh Zahedi	395	Qualitative programming for selection decisions
F. Archetti, E. Fagiuoli and A. Sciomachen	409	Computation of the makespan in a transfer line with station breakdowns using stochastic Petri nets

Sunil R. Das, Ping Chao, 415 Transition submatrices in regular homing experiments Zen Chen, Yow Lung Dai and identification of sequential machines of known and Mrinal K. Das class using direct-sum transition matrices **Software Survey Section** 1 NUMBER 6 i Softstrip® data strip containing the table of contents of this issue P. D. Domich, K. L. Hoffman, 435 Comparison of mathematical programming software: R. H. F. Jackson, a case study using discrete L, approximation codes P. B. Saunders and D. R. Shier Larry Jenkins and Dave Peters 449 A computational comparison of Gomory and knapsack cuts Sang M. Lee, Yong K. Cho and 457 Voice recognition: an examination of an evolving David L. Olson technology and its use in organizations James R. Evans 465 Structural analysis of local search heuristics in combinatorial optimization Taeyong Yang and 479 An algorithm for the scheduling of army battalion James P. Ignizio training exercises Edward L. Hannan and 493 Predicting the impact of instituting a priority re-Christopher J. Gimbrone admission policy in nursing homes George S. Fishman 507 Maximum flow and critical cutset as descriptors of multi-state systems with randomly capacitated components A stochastic programming process model for invest-G. Anandalingam 521 ment planning T. C. E. Cheng 537 An algorithm for the CON due-date determination and sequencing problem

Software Survey Section

